Greetings and welcome to the **SEPTEMBER 2016** edition of the WDFW Climate News Digest. Our purpose is to provide highlights of relevant climate change news, events and resources for WDFW staff. Feedback or suggestions for items to include in future editions are appreciated – *thanks* to those who have sent links and references and please keep them coming.

Thanks for contributions this month from, Wendy Connally, Derek Stinson, Bob Vadas and Larry Dominguez. Other sources for news include: Point Blue Conservation Science, NPLCC Climate Science Digest, Climate.gov, NOAA Climate Newsletter, and "BioClimate", the newsletter of the USGS Climate Science Centers.

New Feature! -- please see the end of this email for a list of useful climate reference sites.

CLIMATE ADAPTATION IN PRACTICE

Climate Adaptation Plan for the Territories of the Yakama Nation

"The Confederated Tribes and Bands of the Yakama Nation are a diverse people from many areas. This document is an acknowledgment that climate change is real and that it poses a threat to our grandchildren, our culture, and our way of living. This document represents the first collective effort by our many governmental departments and programs to identify (1) important resources and cultural components most likely to be impacted by climate change, (2) work we are currently undertaking that recognizes and will help to reduce climate change impacts, and (3) specific recommendations for deeper analyses of vulnerabilities and risks to our most important interests and adaptation actions that we should implement now."

RESOURCES

The Climate Explorer – US Climate Resilience Toolkit *(from Climate.gov)*

Explore maps and graphs of historical and projected climate trends in your local area. View data by topics to see how climate change will impact things you care about.

Ocean Adapt

OceanAdapt is a collaboration between the Pinsky Lab of Rutgers University and the National Marine Fisheries Service (NMFS) to provide information about the impacts of changing climate and other factors on the distribution of marine life to the National Climate Assessment, fisheries communities, policymakers, and to others. This website hosts an annually updated database of scientific surveys in the United States and provides tools for exploring changes in marine fish and invertebrate distributions.

Climate Modeling 101 *(from Climate.gov)*

This website from the National Academy of Sciences is a self-contained, multi-part introduction to how climate models work. The materials include videos and animations about understanding, constructing and applying climate models. **Learn more »**

Free Open Course: Managing for a Changing Climate *(from Climate.gov)*

The South Central Climate Science Center is launching a free online course, open to the general public, on August 17, 2016. This course will provide an integrative understanding of the components of the climate system, including the range of natural climate variability and external drivers of climate change, in addition to impacts of a changing climate on multiple sectors such as the economy, policy, ecosystems, and indigenous populations. **Learn more >>**

EPA Updates Excessive Heat Events Guidebook *(from EPA)*
EPA's *Excessive Heat Events Guidebook* is designed to help community officials, emergency managers, meteorologists, and others plan for and respond to excessive heat events. The guidebook highlights best practices employed by urban areas to save lives during excessive heat events, and provides a menu of options that officials can use to respond to these events in their communities. Earlier this year, to help users find the most up-to-date information about extreme heat, EPA and its federal partners updated Appendix A of the guidebook, "Excessive Heat Event Online Federal Resources."

NOAA launches America's first national water forecast model *(from NOAA.gov)*
NOAA and its partners have developed a new forecasting tool to simulate how water moves throughout the nation's rivers and streams, paving the way for the biggest improvement in flood forecasting the country has ever seen.

IUCN Report: Explaining Ocean Warming - Causes, scale, effects and consequences (*attached)*

Sea Level Rise for the Coasts of Washington, Oregon and California; past, present and future.
A 2012 Report from the National Academy of Science.

LEARNING OPPORTUNITIES

September 17-25, "**SURGE", at the Musuem of Northwest Art** (La Conner)
In partnership with Skagit Climate Science Consortium, Skagit Land Trust, Skagit Watershed Council, and Swinomish Indian Tribal Community, the Musuem of Northwest Art (MoNA) invites you to envision climate change through Surge, a week-long exhibition of art, science, and information centered on climate change and its impacts on Northwest coastal communities.

September 22, 12:00-1:00 (Pacific), "Framework for Evaluating Multiple Species' Vulnerability at Regional Scales"
USGS researchers in the Northwest U.S. are looking at fundamental components of vulnerability for freshwater fishes, amphibians, and reptiles native to the state of Oregon. They have evaluated species-level rarity classifications across a large spectrum of geographic range sizes and climate sensitivity. Their results suggest that a combination of select classifications offer a promising foundation for regional multispecies conservation planning, particularly for data-limited species.
To register now, please click **here.**

September 22, 10:00 – 11:00 (Pacific), "State Resiliency Initiatives: From Issue to Action! Webinar"
The eighth part in the PIE series involves discussions with Bill Nechamen, Chief, Floodplain Management for New York State Dept. of Environmental Conservation; and Iain Hyde, Deputy Director of Colorado Governor's Resiliency & Recovery Office. Chad Berginnis, Executive Director of the Association of State Floodplain Managers, will moderate as they discuss how two different statewide approaches are being implemented to better enable their communities and citizens to be more resilient
To register for this webinar go **here.**

November 14-16, 7th Annual Northwest Climate Conference, Stevenson, WA.
The annual NW Climate Conference is the region's premier opportunity for a cross-disciplinary exchange of knowledge and ideas relating to climate impacts and adaptation. The conference brings together up to 400 researchers, resource managers and policy makers from academia, public agencies, sovereign tribal

nations, non-governmental organizations, and the private sector, to share the latest climate science, challenges to infrastructure, industry, environment and communities, and adaptive solutions.

2017 National Adaptation Forum Call for Proposals
The National Adaptation Forum (NAF) is now accepting proposals for its next gathering, which will be held May 9-11, 2017 in Saint Paul, Minnesota. Participants are invited to submit proposals for symposia, training sessions, and working groups on a variety of adaptation-related topics that can be found on the NAF website. Proposals in these categories are due September 30, 2016. Learn more >>

CLIMATE SCIENCE NEWS

Arctic sea ice ties for second lowest in 2016 *(from Climate.gov)*
In September 2016, Arctic sea ice tied with 2007 for the second-lowest minimum extent in the satellite record, underscoring an ongoing trend of sea ice decline.
Read more »

July was hottest month on record for globe *(from NOAA.gov)*
July is typically the hottest month of the year, and last month didn't disappoint. Analysis confirms 15 consecutive months of record-breaking heat and that July 2016 was the hottest month on record.

Drought is building in places other than California
A checkerboard of drought conditions has developed across the United States east of the Rockies between spring and summer 2016. Since March, the total drought-affected area of the country has nearly doubled. **Read more >>**

Flooding of Coast, caused by Global Warming has already begun *(from the New York Times)*
Scientists' warnings that the rise of the sea would eventually imperil the United States' coastline are no longer theoretical.

Global warming increased risk, intensity of Louisiana's extreme rain event
Three days of heavy rains devastated Louisiana in mid-August 2016. NOAA models find that warming due to greenhouse gases has made an event like that at least 40 percent more likely and 10 percent more intense. Read more »

SPECIES AND HABITATS

Drought, Climate Change Slow Growth Of Douglas Fir Forests
A new study finds the West is likely to see slower-growing Douglas fir trees in the future, as temperatures and droughts increase with climate change.
Researchers with the University of California-Davis took core samples from 122 Douglas fir trees across the region to measure how fast the trees grew over a 91-year period.
The results clearly show that the trees grew more slowly in drought years.

Dungeness Crab and Climate Change *(from NOAA)*
This five-minute video "High Hopes: The Future of the Dungeness Crab", focuses on California fishermen reliant on Dungeness crab for their livelihoods. Filmmakers Benjamin Drummond and Sara Joy Steele also

visit a lab operated by the National Oceanic and Atmospheric Administration where researchers are studying how the vulnerable species will fare as oceans become more acidic due to global warming.

Related article from the Seattle PI: "**As climate change alters the oceans, what will happen to Dungeness crabs?"**
Ecologist Paul McElhany from NOAA describes the results of recent research indicating that contrary to early assumptions that acidification was unlikely to have significant effects on Dungeness crabs, the larvae of this species have lower survival when they are reared in the acidified ocean conditions that we expect to see in the near future. These findings have sobering implications for the long-term future of this US$170 million fishery.

Pikas Disappearing from Parts of the West Due to Climate Change *(from USGS)*
American pikas – small herbivores that typically live in rocky slopes, known as talus, across many mountain ranges in the American West – are disappearing from some locations across the West due to climate change, according to a study by the U.S. Geological Survey and some of its partners. Read more

Climate Influences on Mountain Pine Beetle Outbreaks in Greater Yellowstone *(from the Northwest Climate Science Center)*
Future climate will likely favor mountain pine beetle outbreaks within nearly all current whitebark pine habitat in the Greater Yellowstone Ecosystem by the middle of this century, say researchers with the Northwest CSC. Their findings from a recent study, described in an upcoming publication in *Ecological Applications*, clarify the role of climate on whitebark pine mortality from beetle outbreaks and are important for resource managers involved with risk management. **Learn more >>**

Managing Climate Change Refugia to Protect Wildlife *(from USGS)*
Natural and cultural areas that will remain similar to what they are today – despite climate change – need to be identified, managed and conserved as "refugia" for at-risk species, according to a study from the Northeast CSC published in *PLOS One*. The study sets out, for the first time, specific steps to help identify and manage these havens for plants, animals, and fish. **Learn more >>**

How Climate Change Could Impact National Parks and the Species they Protect *(from National Center for Climate Change and Wildlife Science)*
From retreating glaciers in Alaska to severe drought in the Southwest, climate change is poised to dramatically alter our national parks. The Climate Science Centers and National Climate Change and Wildlife Science Center are actively involved in identifying the impacts of climate change on the species and ecosystems our parks protect. To celebrate the National Park Service centennial, check out 10 projects that provide a snapshot of our work in national parks! **Learn more >>**

Pelicans the pacific northwests newest climate refugees *(from Crosscut)*
Over the last 50 years the median location of pelican colonies across the country has shifted north by almost 200 miles, according to a recent Idaho Fish and Game report

Projected shifts in fish species dominance in Wisconsin lakes under climate change
This paper describes lake-specific suitability for walleye and largemouth bass populations in over 2100 Wisconsin lakes under contemporary and future climate conditions. Many lakes were predicted to shift from supporting walleye to being more suitable for largemouth bass as climate warms; however, the magnitude of these changes depend on lake size, depth, and water clarity. Even under extreme warming conditions, nearly 100 resilient lakes were predicted to continue to support naturally reproducing walleye populations in the future and should be protected from other stressors. We developed a data visualization

website in order to make our results more accessible to a non-technical audience; that website can be found at https://owi.usgs.gov/vizlab/climate-change-walleye-bass/

POLICY, MANAGEMENT, EDUCATION

Washington adopts first-of-its-kind rule to combat climate change
After months of stakeholder meetings, and public review and input, Ecology has adopted a first-of-its-kind clean air rule that caps and reduces carbon pollution.

Final Guidance Released to Support Federal Agencies Integrate Climate Change into National Environmental Policy Act Reviews
The White House Council on Environmental Quality (CEQ) issued this guidance to assist Federal agencies in their consideration of the effects of greenhouse gas (GHG) emissions and climate change when evaluating proposed Federal actions in accordance with the National Environmental Policy Act (NEPA). This guidance will facilitate compliance with existing NEPA requirements, thereby improving the efficiency and consistency of reviews of proposed Federal actions for agencies, decision makers, project proponents, and the public. The guidance provides Federal agencies a common approach for assessing their proposed actions, while recognizing each agency's unique circumstances and authorities. **Read more.**

U.S. Tribes Work with Scientists to Adapt to Climate Change *(from USGS)*
Tribal water managers in Oklahoma have had it tough over the last five years with little precipitation from 2011-2015, high heat in 2011, and torrents of rain and flooding in the summer of 2015. These challenges will likely persist into the future due to climate change. The South Central CSC is working with tribes to identify their unique vulnerabilities, help them cope with emergencies, and develop long-term adaptation strategies. **Learn more >>**

USEFUL CLIMATE LINKS (*with thanks to the NPLCC for their help in compiling this list*)

Monthly Climate Newsletter for Washington State
Office of the Washington State Climatologist (OWSC)

National Integrated Drought Information System (NIDIS)
Pacific Northwest Drought Portal

Monthly U.S. and Global Climate Reports
National Centers for Environmental Information (NOAA), Climate Monitoring Division

University of Washington's Climate Impacts Group
The Climate Impacts Group (CIG) is an internationally recognized interdisciplinary research group studying the impacts of natural climate variability and global climate change ("global warming"). Visit their web page for access to research articles and other resource documents, including the State of Knowledge Report; Climate Change Impacts and Adaptation in Washington State: Technical Summaries for Decision Makers (2013), and State of Knowledge Report State of Knowledge: Climate Change in Puget Sound (2015)

Landscape Conservation Cooperatives
Landscape Conservation Cooperatives (LCCs) are a network of partnerships working in unison to ensure the sustainability of America's land, water, wildlife, and cultural resources. To learn more about the two LCCs in

Washington, please visit North Pacific LCC and the Great Northern LCC. For even further information on LCCs please visit the LCC Network page.

Northwest Climate Science Center

The Northwest Climate Science Center provides climate science and decision support tools to address conservation and management issues in the Pacific Northwest Region.
The NW CSC is part of a national network of Climate Science Centers (CSCs) providing actionable scientific information, tools, and techniques that land, water, wildlife, and cultural resource managers and other interested parties can apply to anticipate, monitor, and adapt to climate change impacts.

Climate.gov

NOAA Climate.gov is intended to be a source of timely and authoritative scientific data and information about climate. Our goals are to promote public understanding of climate science and climate-related events, to make our data products and services easy to access and use, to provide climate-related support to the private sector and the Nation's economy, and to serve people making climate-related decisions with tools and resources that help them answer specific questions

The Oregon Climate Change Research Institute (OCCRI), based at Oregon State University (OSU), is a network of over 150 researchers at OSU, the University of Oregon, Portland State University, Southern Oregon University, and affiliated federal and state labs.

PNW Tribal Climate Change Network

The PNW Tribal Climate Change Network fosters communication between tribes, agencies, and other entities about climate change policies, programs, and research needs pertaining to tribes and climate change.

National Fish, Wildlife, and Plants Climate Adaptation Strategy

The National Fish, Wildlife, and Plants Climate Adaptation Strategy is aimed at providing a unified approach—reflecting shared principles and science-based practices—for reducing the negative impacts of climate change on fish, wildlife, plants, habitats and associated ecological processes across geographic scales.

Climate Change, Wildlife, and Wildlands Toolkit

The Climate Change, Wildlife and Wildlands Toolkit for Formal and Informal Educators is an updated and expanded version of the award-winning and very popular Climate Change, Wildlife and Wildlands Toolkit for Teachers and Interpreters, which was first published in 2001. The kit is designed for classroom teachers and informal educators in parks, refuges, forest lands, nature centers, zoos, aquariums, science centers, etc., and is aimed at the middle school grade level.

FWS Climate Change Information Toolkit

A key part of the Service's climate change strategy is to inform FWS staff about the impacts of accelerating climate change and to engage partners and others in seeking collaborative solutions. Through shared knowledge and communication, we can work together to reduce the impacts of climate change on fish, wildlife, plants and their habitats. Here are some **resources** that can help.